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Scientific Report

to

United States Air Force
Air Force Office of Scientific Research
Building 410
Bolling Air Force Base, DC 20332

Grant No. AFOSR-83-0287

ULTRASTRUCTURE PROCESSING OF CERAMICS, GLASSES AND COMPOSITES

Submitted by

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Gainesville, FL 32611

September 1, 1984

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Introduction

→ The purpose of this \$100,000 grant was to purchase an Inductively Coupled Plasma (ICP) Chemical Analysis System, a Fourier Transform InfraRed Gas Cell Accessory, and other accessories for the characterization of chemically processed ceramics, glasses, and composites. (A W)★

Equipment Purchased

After review of various manufacturers of ICP equipment competitive bids were received (U of F Bid #B4-133) and the purchase was made from the Instrumentation Laboratory (IL) Corp., 2410 Park Central Blvd., Decatur, Georgia 30035. The amount was \$72,400.

Other major equipment items purchased to complement the ICP for chemical characterization were: DuPont Thermomechanical Analyzer, \$12,550; Pt crucible and cover from Johnson Matthey, \$4,212; miscellaneous laboratory accessories from Fisher Scientific and Instron Corp totalling \$5,838; and a FTIR Diffuse Reflection Stage Model 3-D and Vacuum Chamber for \$5,000 from Barnes Analytical, 652 Glenbrook Rd., P. O. Box 2190G, Stamford, Connecticut 06906.

Research Projects

The above instruments have been used primarily on the Multi-Investigator Research Project "Ultrastructure Processing and Environmental Stability of Advanced Structural and Electronic Materials", Contract #F49629-83-C-0072.

The ICP has been used to analyze the starting metal organic constituents in our sol-gel research. We have been able to show ppb level of purity of the starting materials. We also have used the ICP in studying mechanisms of glass corrosion and environmental interactions.

The analytical accessories from DuPont, Johnson Matthey, Fisher and Instron have also been used to determine structural changes in the sol-gel materials and compare them with glasses and glass-ceramics made from standard glass-melting methods.

The FTIR stage has made it possible to follow the chemical structural changes occurring in the liquid reactions of sol-gels and during drying and densification.